REMARKS

The application contains claims 1-57. Claims 1-2, 9-10, 14, 19, 23-24, 29-30, 40, 44-45, 49-52 and 56-57 have been amended. In view of the foregoing amendments and following remarks, Applicants respectfully request allowance of the application.

At the outset, Applicants thank the Examiner for the thorough analysis of his 36 page office action. The Office Action contains several helpful suggestions to facilitate prosecution of the application and many have been adopted.

Applicants firmly believe that the subject matter represented by the pending claims is very different from the cited art. Previously, Applicants' representative requested an interview to explain the claimed inventions and differences between them and the prior art. The Examiner suggested instead that he preferred to conduct an interview after consideration of a written response. After consideration of this paper, if the Examiner chooses to maintain any of the rejections raised in the prior Action, Applicants respectfully request an interview before issuance of the next action to discuss the merits of the pending claims.

THE CLAIM OBJECTIONS AND INDEFINITENESS REJECTIONS ARE OVERCOME

The foregoing amendments have adopted the amendments suggested by the Office Action in paragraph 7, with respect to claim 45. The amendments suggested in paragraph 9 with respect to claims 50-52 and 54-55 have been adopted.

With respect to claims 53 & 56, Applicants respectfully decline to adopt the suggested amendment because the invention finds application not only in computers but in a wide variety of communication receivers. It could cause confusion to refer solely to a computer in the preambles of these claims. Such operations often will be performed by a processor of some kind and, therefore, Applicants believe the claims are adequate as written. If the Examiner prefers, Applicants would be willing to accept an amendment to the preamble having the following structure:

> A computer readable medium, having stored thereon instructions that, when executed **by a processor**, cause **the** [a] processor to...

Applicants submit that no surrender of subject matter would occur due to entry of such an amendment. If the Examiner believes such an amendment is necessary, Applicants invite the Examiner to make such modifications by an examiner's amendment.

THE CLAIMS DEFINE STATUTORY SUBJECT MATTER

Claims 1-28 and 30-39 stand rejected as failing to define statutory subject matter. Applicants respectfully requests reconsideration. The specification and claims clearly define an invention that is directed to the communication arts. The reliable symbols detection method is a precursor to equalization to correct corruption that occurs due to intersymbol interference. It clearly finds application in communication receivers, which are statutory.

Although Applicants believe the claims as originally filed are statutory, claims 1-25 have been amended to refer to the method being performed upon values of ***captured*** samples. As such, the captured samples refer to physical phenomena. These claims are statutory.

Applicant respectfully requests withdrawal of the § 101 rejection to claims 30-39. The claims are directed to an equalization method, which clearly is statutory. Moreover, the claims refer to correction of channel effects, which is a physical phenomenon. These claims also are statutory. Accordingly, Applicants request withdrawal of the outstanding § 101 rejections.

THE PRIOR ART REJECTIONS

Claims 1-9 and 53-55 Define Over the Cited Art.

Claims 1 and 53 are not anticipated by Hassan.

Claims 1 and 53 stand rejected as anticipated by Hassan, U.S.P. 6,581,179. Applicants respectfully request withdrawal of the rejection because Hassan does not teach or suggest all elements of the pending claims. Claims 1 and 53, for example, recite:

Claim 1: calculating a reliability factor of a candidate sample ***from values of a plurality of samples in proximity to the candidate sample,***

Claim 53: calculate a reliability factor of a candidate sample ***from values of a plurality of samples proximate to the candidate sample,***

Hassan does not teach or suggests this subject matter. While Hassan refers to "reliability" very generally, he does not identify how reliability of any specific sample is to be determined. Hassan certainly does not describe that the reliability of a candidate sample is determined from value of other samples, in proximity to the candidate sample.

According to these claims, the reliability of a particular sample (blue) is determined by examining the sample's neighbors (red).[1] A reliability factor for a candidate sample (sample t) is calculated from values of a plurality of samples in proximity to the candidate sample (in one embodiment, those shown in red) and, if the reliability factor is less than a predetermined limit, the candidate sample is designated as a reliable symbol.

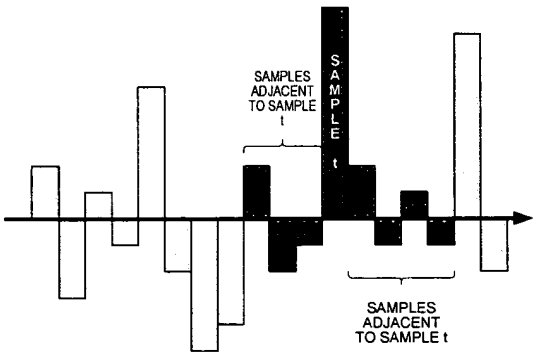

Figure 1

Hassan's system, by contrast, uses training bits. The training bits have values that are known both at the transmitter and a receiver. A detector determines a distance between the value of the transmitted training bits and the values that are received. Hassan compares the value of a received bit to a known transmitted value. He does not describe calculating a reliability factor of a sample by considering the values of proximate samples, then comparing it against a predetermined limit. Accordingly, Applicants respectfully submit that claims 1 and 53 define over the cited art and the rejection should be withdrawn.

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[1]Although claim 1 does not specify that adjacent samples are considered on both sides of the candidate samples, the illustration is useful to demonstrate conceptual differences between claim 1 and the cited art. The illustration should not be viewed as limiting the scope of the claim. Instead, claim 1 should be considered on its own terms.

Dependent Claims 2-5 and 54 are not obvious over Hassan and Dent.

Claims 2-5 stand rejected as obvious over Hassan and Dent, U.S.P. 6,556,634. Applicants respectfully requests withdrawal of these rejections. Dent does not disclose the mathematics recited in dependent claims 2-5. The sum represented in claim 2 refers to neighboring sample positions (y_{n-i}) in a data stream, for example the red samples in the foregoing illustration. Dent describes operations performed when merging multiple data streams received from different prongs of a RAKE receiver into a common stream. Applicants see no similarity between Dent's system and the claimed invention. If the Examiner intends to maintain the rejections, Applicants respectfully request a better explanation of how support for the equation of claim 2 is found in the cited art.

More importantly, the cited portions of Hassan and Dent are not related to each other. The Office Action cites to Hassan's discussion of reliability and to Dent's description of RAKE decoding. Reliability and decoding are different processes. It is not clear why anyone would be motivated to apply Dent's teachings to the Hassan system for any purposes. Applicants, therefore, respectfully submit that these references cannot be considered together for obviousness purposes.

Claim 54 contains the same mathematical expression as claim 2 and, therefore, is allowable for the same reasons.

Claim 6 is not obvious over Hassan and Bottomley.

Applicants respectfully request withdrawal of the rejection to claim 6 because the disclosure of Hassan and Bottomley, even if considered together, does not render the subject matter of claim 6 obvious. First, as noted above, Hassan does not disclose the subject matter of independent claim 1. With respect to claim 6, however, the excerpt cited from Bottomley simply describes a common event that occurs in mobile communication -- channel interference conditions change over time.

Changing channel conditions will lead to changes in the corruption that occurs to candidate samples. It does not provide a suggestion, however, to vary the threshold of claim 6, which determines whether a candidate samples is a reliable symbol. Varying the threshold can

lead to more or fewer candidate samples being designated as reliable. This is a different phenomenon than the scenario presented by Bottomley. Applicants, therefore, submit that claim 6 is non-obvious.

Claims 10-18 Define Over the Cited Art.

Claims 10-12 are not obvious over Hassan and Dent.

Claims 10-12 stand rejected over Hassan and Dent. Claim 10 is mathematically similar to the operations of claim 2 but it permits the calculation of the reliability factor to terminate early if the threshold it exceeded. As discussed above, Hassan and Dent are directed to operations that are different from each other and certainly different from the claimed invention. Although Hassan refers to reliability generally, he does not teach the subject matter of claim 10 such as:

> for a candidate sample y_n ... adding to a reliability factor based on a value of the sample y_{n-i},
> if the reliability factor exceeds a predetermined limit, disqualifying the candidate sample as a reliable symbol,

As noted earlier, Hassan does not show any relationship between a candidate sample y_n and neighboring samples y_{n-i}. Hassan also does not compare any reliability factor to a predetermined limit.

Dent is directed to decoding of data from consideration of data signals input to it from multiple RAKE receiver branches. Respectfully, Applicants see no relevance between Dent and Hassan which would lead a skilled worker to consider these references together.

Claims 14-15 is not obvious over Hassan, Dent and Isaksson.

Claims 14-15 are dependent claims, depending from claim 10. As noted above, Hassan and Dent fail to teach or suggest the subject matter of claim 10. Hassan, Dent and Isaksson also fail to teach or suggest the subject matter of claims 14 and 15. These claims recite:

> **Claim 14**: wherein the predetermined limit is half a width of an annular constellation ring in which the candidate sample is observed.

> **Claim 15**: wherein the predetermined limit is $(K_1 + K_2)d_{min}$ where d_{min} is half a distance between two constellation points that are closest together in a governing constellation.

Isakson is cited as disclosing this subject matter. Isaksson, however, discloses switching between various constellations in certain scenarios. Isaksson, Abstract and Col. 2:31-44. Isaksson does not use the space between any constellation points in a threshold detection system to determine reliability of received samples. Therefore, this combination of references does not render claim 14 or 15 obvious. Applicants respectfully request withdrawal of this rejection.

Claim 16 is not obvious over Hassan, Dent and Bottomley.

Claim 16 is a dependent claim that depends from claim 10. Like claim 6, claim 16 recites that the threshold may vary over time. The deficiencies of the cited art – Hassan, Dent and Bottomley – are discussed at length above with respect to claims 10 and 6. Applicants respectfully request withdrawal of the obviousness rejection to claim 16.

Claims 19-28 Define Over the Cited Art.

Independent claims 19 and 25 are not obvious over Dent and Verma

Claim 19 describes a method of determining reliability that represents a shortcut over the methods of claim 1 or claim 10. In this scheme, when determining whether a candidate sample (say, y_n) is reliable, the method compares the value of neighboring samples (y_{n-i}) to a predetermined threshold. If one of the neighboring samples (y_{n-i}) exceeds the threshold, then sample y_n cannot be reliable.

Neither Dent nor Verma disclose this subject matter. As described above, Dent mathematically merges data from various branches of a RAKE receiver into a unitary, decoded data stream. Verma does not provide the necessary disclosure. Verma discloses techniques for peak to average power ratio reduction in ***transmitters***. This has nothing to do with reliable symbol detection. While Verma refers to use of thresholds generally, he has no teaching to use such thresholds in the context of the invention recited in claim 19 – to determine whether a

candidate sample can be designated a reliable symbol or not. Applicants respectfully request withdrawal of the rejections to claim 19.

Claim 25 also represents a shortcut method when compared to the structure of claim 1 or 10. In claim 25, a sequence of signal values having values within a predetermined limit is identified. A sample adjacent to this sequence is identified as a reliable symbol. The limitations of Dent and Verma, described above with respect to claim 19, also apply here. As noted, Dent is directed to decoding of data by RAKE ***receivers***. Verma is directed to an entirely different purpose, management of power ratios in ***transmitters***. These references have nothing to do with each other. Further they have nothing to do with the subject matter of the claim 25, reliable symbol detection. Therefore, the rejection to claim 25 should be withdrawn.

Claims 20 and 26 are not obvious over Dent, Verma and Bottomley.

Claims 20 and 26 depend respectively from claims 19 and 25 and further recite a variable threshold. As discussed above, Dent and Verma do not render independent claims 19 or 25 obvious. Further, Bottomley describes variable channel corruption effects but not variable thresholds to determine whether candidate symbols are reliable. Claims 20 and 26 also define over the art.

Claims 23 and 24 are not obvious over Dent, Verma or Temerinac.

Claims 23 and 24 stand rejected as obvious over three references – Dent, Verma and Temerinac, U.S.P 6,477,215. Applicants respectfully request reconsideration. As noted above, Dent's disclosure should not be considered in combination with Verma's disclosure because they are directed to processes that occur at separate elements in a communication system. Dent describes a data processing system that occurs at a RAKE ***receiver*** while Verma's disclosure represents a process that occurs at a ***transmitter***.

Temerinac discloses detection of timing differences between a transmitter and a receiver:

> The measured phase and amplitude error values can represent a measure of the respective reliability. The smaller the error values, the greater the reliability and

> the smaller the probability that ***the timing error value*** is determined incorrectly. Col. 3:17-21.

It does not teach or suggest the subject matter of claims 23 or 24, which describe a relationship between a candidate sample and the neighboring captured samples that are relevant to the reliability determination. Accordingly, claims 23 and 24 are allowable over the cited art.

Claims 29-43 and 56-57 Define Over the Cited Art

Claims 29-30, 38, 40 and 56-57 are not anticipated by the cited art.

Claims 29-30, 38, 40 and 56-57 stand rejected as anticipated by Agazzi, et al. Applicants have amended these claims as discussed below.

Claim 29, as amended, distinguishes over Agazzi. Specifically, claim 29 recites:

> a reliable symbol detector to detect reliable symbols from a sequence of captured samples, the reliable symbols being the captured samples which are estimated to have been corrupted least by intersymbol interference,
>
> an adaptation unit coupled to the reliable symbol detector to generate ISI metrics based on the reliable symbols, and

Agazzi does not disclose such subject matter. He discloses use of a symbol-by-symbol decoder 28 (FIG. 1), which appears to operate on every received symbol in the order in which it was received. Agazzi acknowledges in fact that the decisions of the symbol-by-symbol decoder 28 are not reliable and are improved by the concatenated decoder 50. Equalizer adaptation, however, is performed based on the results obtained from the symbol-by-symbol decoder 28. Claim 29, therefore, distinguishes over Agazzi.

Claim 30 has been amended similarly. It now recites:

> identifying reliable symbols from a string of captured samples, the reliable symbols being the captured samples which are estimated to have been corrupted least by channel effects,

As noted, Agazzi does not estimate which of the captured samples are corrupted least by channel effects and then calculate the channel effects based on these samples and sample adjacent thereto. Claim 30 and dependent claims 31-39, therefore, are allowable over Agazzi.

Claim 40 has been amended and now recites:

> a reliable symbol detector in communication with the buffer memory, the detector to estimate which samples from a sequence of captured samples have been corrupted least by channel effects,
>
> an adaptation unit in communication with the reliable symbol detector to estimate channel effects based on the values of the reliable symbols and samples adjacent thereto, and

As noted above, Agazzi does not disclose any process through which a detector estimates which samples have been corrupted least by channel effects then estimate the channel effects based on these samples. Claims 40 and dependent claims 41-43, therefore are allowable over Agazzi.

Claims 56 and 57 both have been amended in a manner similar to the amendment of claim 30 and are allowable on that basis.

Dependent Claims 31 and 41 define over Agazzi and Hassan.

Dependent claims 31 and 41 stand rejected as obvious over Agazzi and Hassan. As described above, independent claims 30 and 40 are allowable in view of the foregoing amendments. Applicants note further that Hassan fails to teach or suggest the additional subject matter of claims 31 and 41. As noted above, Hassan does not teach a calculation of a reliability factor for a candidate sample from values of neighboring samples. Hassan's disclosure is limited to comparisons of received training bits against known versions of those same bits. Claims 31 and 41 are allowable over the cited art.

Dependent claims 32, 33 and 42 define over Agazzi, Hassan and Dent.

Dependent claims 32, 33 and 42 stand rejected as obvious over Agazzi, Hassan and Dent. As described above, independent claims 30 and 40 are allowable in view of the foregoing amendments. Applicants note further that Dent fails to teach or suggest the additional subject matter of claims 32, 33 and 42. As described above, Dent does not teach or suggest the mathematics of these claims. Dent's disclosure is limited to processing of data streams from multiple RAKE receivers.

Dependent claim 35 defines over Agazzi, Dent and Verma.

Dependent claim 35 stands rejected as obvious over Agazzi, Hassan and Dent. As described above, independent claims 30 and 40 are allowable in view of the foregoing

amendments. As described above, Verma's disclosure is limited to power ratio management in transmitters and has no relevance to the claimed invention.

Dependent claims 36 and 37 are not obvious over Agazzi and Temerinac.

Dependent claims 36 and 37 stands rejected as obvious over Agazzi and Temerinac, U.S.P 6,477,215. As described above, claim 30 defines over the art and, therefore, dependent claims 36 and 37 are allowable as well. Additionally, Temerinac's disclosure is directed to a different problem than that of the pending claims or Agazzi. Temerinac refers to detection of timing differences between a transmitter and a receiver:

> The measured phase and amplitude error values can represent a measure of the respective reliability. The smaller the error values, the greater the reliability and the smaller the probability that ***the timing error value*** is determined incorrectly. Col. 3:17-21.

Thus, neither Temerinac nor Agazzi are directed to the problem of estimating which captured samples are corrupted least by the channel effects and then using these samples – the reliable symbols – to estimate the channel effects and decode the remainder of the samples. Claims 36 and 37 are allowable over the cited art.

Claims 44- 48 Define Over the Cited Art.

Claims 44-45 and 48 define over Hassan and Agazzi.

Independent claim 44 has been amended to recite:

> a reliable symbol detector in communication with the buffer memory to identify which of the stored captured samples are likely to have been corrupted least by channel effects, the identified samples being reliable symbols,
>
> an adaptation unit in communication with the reliable symbol detector to estimate channel effects from values of the reliable symbols, and

The cited art does not teach or suggest this subject matter. As indicated, Hassan compares the values of received training bits against known values of those bits to determine whether a slot is reliable or not. Hassan, Col. 2. Hassan does not disclose an identification of which stored samples are likely to have been corrupted least by channel effects. Nor does he disclose using the values of those reliable symbols to estimate channel effects.

Similarly, Agazzi's disclosure is deficient. As noted, Agazzi's symbol-by-symbol decoder 28 generates decisions that may not be reliable. Even so, Agazzi's system performs equalization adaptation based on the results generated from this decoder. This is a far cry from the system defined in claim 44, where reliable symbols are identified from a larger set of candidate samples and used to estimate channel effects. Claim 44, therefore, defines over this art.

Dependent claim 45 defines that a reliability factor for a candidate sample is calculated from values of samples proximate to the candidate sample. See, the illustration above on page 16. Hassan, as noted, compares received values of training bits against know values of those same bits. Agazzi does not seem to calculate a reliability factor at all. Claim 45, therefore, is allowable over the cited art.

Claim 46 is not obvious over Hassan, Agazzi and Dent.

The office action asserts that Dent recites the mathematical relationship of claim 46. As explained above, this is incorrect. First, the mathematics themselves are not shown. More importantly, however, Dent is directed at a different purpose than is claimed here. Dent does not teach or suggest calculation of any reliability factor. Instead, Dent is directed to decoding of data received from multiple branches of a RAKE receiver. Accordingly, claim 46 defines over the cited art.

Claims 49-52 Define Over the Cited Art

Claim 49 defines over Hassan, Isaksson and Agazzi

Claim 49 has been amended to recite:

> identifying reliable symbols from the captured samples, ***reliable symbols being those captured samples that are estimated to be corrupted least by intersymbol interference,***
>
> calculating channel effects based on the reliable symbols and samples proximate thereto,

None of the cited art teaches or suggests this subject matter. As noted, Hassan merely compares received training bits against known values of the training bits and Agazzi estimates

channel effects based on the output of his symbol-by-symbol detector 28, no matter how unreliable they may be. Although Isaksson discloses use of multiple constellations, his disclosure does not cure the deficiencies of either Hassan or Agazzi. Claim 49, therefore, defines over this art.

Dependent claim 50 is not obvious over Hassan, Isaksson and Agazzi.

Dependent claim 50 further recites that a reliability factor for a candidate sample is calculated from values of other samples, proximate to the candidate sample. As noted with respect to claim 45 and other, the cited art does not teach or suggest this feature. Claim 50 also is allowable over the cited art.

Dependent claim 51 is not obvious over Hassan, Isaksson, Agazzi and Dent.

Dependent claim 51 specifies the mathematical calculation for reliability factors recited in claim 2 and elsewhere. The office action cites Dent as providing this disclosure but, as noted in the discussion of claim 2, Dent does not disclose this subject matter. Dent also is directed to a different purpose. Accordingly, claim 51 is allowable over the cited art.

CONCLUSION

Applicants respectfully submit that all claims are allowable over the cited art. Allowance is solicited.

Respectfully submitted,

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Robert L. Hails, Jr.
Registration No. 39,702

KENYON & KENYON
1500 K Street, N.W.
Washington, D.C. 20005
Ph.: (202) 220-4200
Fax.: (202) 220-4201